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Jelena Birovljev
University of Novi Sad
Faculty of Economics in Subotica
Department of Agro-Economics and Agro-Business

Žana Kleut
University of Novi Sad
Faculty of Economics in Subotica
Department of Agro-Economics and Agro-Business

ANALYSIS OF THE FACTORS OF SUSTAINABLE AGRICULTURE IN SERBIA AND THE EUROPEAN UNION MEMBER STATES

Analiza faktora održive poljoprivrede u Srbiji i zemljama Evropske unije

Abstract

The consequences of negative impact of agriculture on sustainable use of resources require the development of modern agricultural practices in linewith ecological principles which are sustainable in the long term. The main objective of this research is to define the model of sustainable agriculture, observedthrough different dimensions of sustainability, with the support of the multivariate analyses: principal component analysis and factor analysis. In addition to this, the paper defines the level of development of agriculture in Serbia in comparison to EU member states. The importance of determining the position of Serbia in relation to the EU member statesis reflected in the necessary harmonization of agrarian policy of Serbia and the EU, as well as of the environmental policies. The research results point to a multidimensional approach to sustainable agriculture, where there are significant differences in practice, in terms of economic, technological and environmental aspects of the development. Considering the lower level of development of agriculture in Serbia compared to European Union member states, the opportunity for sustainable agricultural development in Serbia are the IPA funds, respectively the IPARD component of pre-accession assistance availableto candidate countriesfor EU accession, aimed at reducing development disparities.

Keywords: *sustainable development, agriculture, factor analysis, Serbia, European Union.*

Sažetak

Posledice negativnog uticaja poljoprivrede na održivu upotrebu resursa iziskuju razvoj moderne poljoprivredne prakse, koja je u skladu sa ekološkim principima, odnosno održiva na dug vremenski period. Osnovni cilj ovog istraživanja jeste definisanje modela održive poljoprivrede, putem različitih dimenzija održivosti, koristeći multivarijacione metode: analizu glavnih komponenti i faktorsku analizu. Takođe, u radu je definisan nivo razvoja poljoprivrede Srbije u odnosu na zemlje EU. Značaj određivanja pozicije Srbije u odnosu na zemlje EU ogleda se u potrebi harmonizacije agrarne politike Srbije i EU, kao i usklađivanja politika za zaštitu životne sredine. Rezultati istraživanja ukazuju na multidimenzionalni pristup konceptu održive poljoprivrede, pri čemu postoje značajne razlike u praksi u pogledu ekonomskih, tehnoloških i ekoloških aspekata razvoja. S obzirom na niži nivo razvoja poljoprivrede Srbije u odnosu na zemlje EU, mogućnosti za održivi razvoj poljoprivrede Srbije predstavljaju IPA fondovi, odnosno IPARD komponenta pretpristupnih fondova, koja je namenjena kandidatima za članstvo u EU, s obzirom na to da se ova sredstva usmeravaju ka smanjenju razvojnih dispariteta.

Ključne reči: *održivi razvoj, poljoprivreda, faktorska analiza, Srbija, Evropska unija.*

Introduction

Sustainable agriculture is a multidimensional concept of development, which was created in response to the degradation and vulnerability of natural resources. As such, it is defined in Agenda 21, emphasizing the importance of the production system that combines elements of economic and environmental production [20]. Accordingly, Edwards [4] argues that sustainability of agriculture meansadjusting conventional production, i.e.the use of more efficient technologieswhich will reduce or eliminate undesirable effects, primarily on the environment. Academic literature offers various definitions of sustainable agriculture, which is viewed as production that provides profitability to the farmer (cash economy)on one hand, but on the other implies efficient management of agricultural land and other resources aimed at long-term survival of this sector (subsistence economy) [8]. In other words, it implies balance with the agroecological environment where the production takes place. Also, many authors highlight the significance of the sociological aspect of agriculture, which means that, in addition to productivity and profitability and environmental production, the concept of sustainable agriculture also includes quality of life [9]. In essence, it is difficult to precisely define this concept, in view of the fact that it implies economic, sociological and ecological sustainability of agriculture [23], [15], [16]. These three fundamental dimensions of sustainability point to the complexity of this concept, where the sustainable development of agriculture is reflected in fundamental changes in this sector. Birovljev et al. [2] point out that sustainable agriculture means the maximum use of renewable resources and effective category management, which involves a combination of traditional and modern technologies. It is precisely the importance of this concept that is reflected in the introduction of new and modern technologies in production, which yieldmultiple benefits for society as a whole.

Attaining the status of candidate for accession to the European Union implies a constant need for ranking the development of agriculture inSerbia and the EU member states, as this is the way to definethe base for harmonizing the agricultural policy of Serbia and the CAP. It is therefore essentialto define the position of Serbia in relation to the EU member states. This is in linewith Serbia's focus on full membership withinthe Union. This study observes the level of development of agriculture inSerbia and the EU member states through performance of agriculture aimed at the concept of sustainable development of this sector. Consequences of the negative impact of agriculture on natural resources, i.e.excessive utilization of soil and water, and disruption of biodiversity feature as the key issue of national policies. Integration of sustainable development into national policies has enabled the adaptation of conventional agriculture to environmental principles, in other words, the preservation of the agroecosystem. The EU's Common Agricultural Policy (CAP) for 2014-2020 includes definitions of support measures aimed directly at preservation of the environment, i.e. green direct payments. The CAP's budget framework includes the application of green payments, amounting to 30% of national funds, intended for producers applying good agricultural practices aimed at the protection of agro-environment [11]. In accordance with the concept of sustainability of agriculture, such a form of subsidizing agriculture is aimed at agroecological measures, at supporting organic production, and at innovative projects contributing to the preservation of environment [6]. As far as Serbia is concerned, the measures for sustainable development include a defined amount of funds for preservation of the environment, which are channeled primarily to organic production and preservation of genetic resources. The amount of these funds, however, is insignificant. In addition to this, inadequate protection of agro-environment in Serbia stems from undefined legal regulations [2].

Academic literature offers different classifications of sustainability indicators. In practice, the number of indicators is most dependent on the availability of other data sources, and on the possibility to quantify them. The European Commission uses the Sustainable Development Indicators (SDIs), a pyramid of indicators enabling the comparison of EU member statesby takinginto account socio-economic development, climate changes and energy consumption, sustainable production and its productivity, natural resources, quality of life, demographic changes and globalization processes. The OECD defines sustainability of agricultural production through agroecological indicators, such as agricultural output, utilization of agricultural land, number and size of farms, use of inputs (fertilizers and pesticides), irrigation, organic production etc. It also defines clear impacts of agriculture on the environment through the quality of soil, water, air pollution etc.[13]. Stockle et al. [18]observethe concept of sustainability of agriculture through nine key indicators: profitability of production, productivity, quality of resources, energy efficiency, biodiversity, quality of life and social progress. Gomez-Limon et al. [7] define sixteen indicators of sustainability: revenue from agricultural production, share of agriculture in GDP, share of ensured agricultural production, employment in agriculture, stability of employment in this sector, risk of abandoning production, economic dependence of the farming sector, specialization, plot size, amount of salt in the soil, use of nitrogen fertilizers, use of phosphorus fertilizers, use of pesticides, irrigated areas, energy utilization and biodiversity protection.The essence of agriculture makes up its dynamism, as well as its interdependence and unbreakable bond with nature.Numerous negative consequences onsoil, water, air, biodiversity and human health have made it necessary to introduce significant changes in agricultural production, and todevelop more ecologically sustainable systems that are introduced in the production control system documentation and certification and which, therefore,guaranteesafety for consumers.

On the basis of the various classifications of indicators in the context of this study, sustainable agriculture is defined by fourteen overall performance indicators, enabling comparative analysis of Serbia with the EU member states. The paperis divided into four segments. After an introduction followed by an elaborationof the methods employedin the study and the research results, the last segment offersconclusions adopted on the basis of the results presented above.

Research methodology

The aim of this paper is to identify different dimensions of sustainability of agriculture through factor analysis. The model of sustainable agriculture was defined through fourteenindicatorswhich couldbe directly or indirectly related with the process of sustainable development of agriculture. The research database was compiledby usingavailable data sources: the Statistical Office of the European Communities (EUROSTAT), FAOSTAT, andthenationaldatabasesfor Serbia (Statistical Office of the Republic of Serbia) and Croatia (Croatian Bureau of Statistics). The observation period is approximately fiveyears, from 2008 to 2012. As Croatia was not an EU member state in the said period, it is important to note that it was included in the analysis. Statistica 12 software was employedinthis research. The empirical assessment of sustainability entails certain problems, such as the time period of observation, or the inability to assess all the factors affecting sustainable development of agriculture [7]. There were also some limitations related to the selectionof model variables in terms of insufficient data, primarily for Serbia (for instance, lack of adequate data on the use of pesticides in the agriculture of Serbia for the observation period).Indicators of sustainable agriculture include the production and export performance, as well as the indicators that evidenced the importance of agriculture in the overall economy of the country (share in GDP and the share intotal employment). These indicators demonstratethe level of development of the agrarian sector in a country. The analysis also included environmental indicators. Defined indicators of sustainable agriculture are:

- Share of agriculture in the total gross domestic product (% of GDP);
- Share of employment in agriculture in the total employment (%);
- Labor productivity in agriculture;
- Agricultural exports per active agricultural producer;
- Agricultural exports per hectare of agricultural land;
- Average economic size of farms (standard output/ number of farms);
- Yield of cereals per hectare (kg/ha);
- Livestock unit per hectare (LU/ha);
- Share of arable land in the total agricultural land (%);
- Used fertilizer (kg/ha);
- Share of irrigated areas in the total agricultural land (%);

- Share of areas under organic production in the total agricultural land (%);
- Costs for environmental protection (EUR per capita);
- Greenhouse gas emission from agriculture (%).

The study employed methods of multivariate techniques: principal component analysis and factor analysis. Factor analysis has beenincreasingly used over the last decade in all areas of business research, and itis particularly suitable for analysis of complex schemes and multidimensional relationships the researchers are facing with. The significance of factor analysis is reflected in the reduction of the number of variables to a smaller set of variables, i.e. factors [3], [19]. This analysis is based on the principal component analysis, with varimax factor rotation. The results of the principal component analysis are eigenvalues, which represent the number of factors within a data series. This study includes all factors with eigenvalues higher than 1, and within which the factor loadings are higher than 0.7. The final step of the factor analysis is determining factor values for each unit of observation (EU member statesand Serbia), i.e. the factor scores. Factor scores enable the countries to be ranked in relation to indicators pertainingto a given factor. This allows for a comparison to be madebetweenSerbia and other countries included in the analysis, in relation to the defined dimensions of sustainability.

Research results

Eigenvalues, beingthe variables of main components, show the number of factors expected within the factor analysis. This study contains four factors with eigenvalues higher than 1 (Table 1). Also, 77.23% of total variations are explained by these four factors.

The following step of the factor analysis comprises grouping indicators into factors. The results of the factor analysis, with valmax factor rotation, reveal the structure of data where the indicators are classified into four groups. Grouping implies a strong correlation of indicators with a certain factor.

The first factor (F1) includes the following indicators: labor productivity in agriculture, agricultural exports per active agricultural producer, agricultural exports per hectare of agricultural land, average economic size of farms, yield of cereals per hectare, total number of livestock units per hectare and costs for environmental protection. Given the nature of the indicators, this factor stands asthe general level of development of a country's agriculture. Respectively, higher productivity of land and labor, better export performance and higher average economic size of farms are characteristics of the developed countries. In addition to this, highly developed countries have higher expenditures for environmental protection. The second factor (F2) comprises two indicators: share of arable land in the total agricultural land and used fertilizer per hectare. Ranking thecountries revealsin which country the used fertilizer per hectare is more present, in other words, which country has a lower share of arable land in the total agricultural land. The third factor (F3) includes the share of irrigated areas in the total agricultural land and emission of greenhouse gases from agriculture, with these countries being ranked according to the higher share of irrigated areas in the total agricultural land and lower emission of greenhouse gases. The fourth factor (F4) coversindicators that show the importance of agriculture in the economy of a country (share of agriculture in the total gross domestic product and in total employment) and the share of areas under organic production in the total agricultural land. The final step of factor analysis is to determinefactor scores for each country within this study and to rank the countries within each factor (Table 3).

Table 1: Principal component analysis

No.	Eigenvalue	% of total variance	Cumulative eigenvalue	Cumulative variance %
1	5.944903	42.46359	5.94490	42.46359
2	2.083015	14.87868	8.02792	57.34227
3	1.564275	11.17339	9.59219	68.51567
4	1.218406	8.70290	10.81060	77.21857

Source: The authors' own calculations

Table 2: Grouping sustainable agriculture indicators into factors

	Factor loadings			
	F1	F2	F3	F4
Share of agriculture in the total gross domestic product (% of GDP)	-0.377647	-0.135499	-0.071826	-0.689889
Share of employment in agriculture in the total employment (%)	-0.258497	-0.108190	-0.289218	-0.720723
Labor productivity in agriculture	0.682540	0.072928	0.190560	0.368130
Agricultural exports per active agricultural producer	0.881063	0.111884	0.045913	0.096901
Agricultural exports per hectare of agricultural land	0.883213	0.054781	0.200238	-0.080872
Average economic size of farms (standard output/number of farms)	0.843724	-0.178707	-0.020339	0.235294
Yield of cereals per hectare (kg/ha)	0.820410	0.305921	-0.198486	0.165448
Livestock unit per hectare (LU/ha)	0.808515	0.420279	0.177524	0.152758
Share of arable land in the total agricultural land (%)	0.011495	-0.799321	0.106717	-0.156154
Used fertilizer (kg/ha)	0.296245	0.843571	-0.005475	-0.080403
Share of irrigated areas in the total agricultural land (%)	-0.007504	0.055090	0.905645	0.023214
Share of areas under organic production in the total agricultural land (%)	-0.168652	-0.437144	-0.385982	0.741125
Costs for environmental protection (EUR per capita)	0.708510	0.063983	0.384802	0.367261
Greenhouse gas emission from agriculture (%)	-0.239851	0.351418	-0.674183	-0.197668

Source: The authors' own calculations

Factor 1, whose eigenvalue is 5.94, accounts for 42.46% of total variations. It comprises seven indicators, as defined in the previous section of the paper. Given the nature of the indicators, the first factor views the economic dimension of sustainable agriculture. These indicators speak of a general level of development of agricultural production. Also, the ecological indicator (costs for environmental protection) indicates the general level of development in a country. The largest factor scores (Table 3) are observed in the Benelux countries, Denmark, Germany, France and the UK. Taking into accountthe position of Serbia in relation to the EU member states,it is noticeable that the agriculture inSerbia lags behind the agricultures of other countriesin terms of development. Such results are devastating, as the long-term concept of sustainable development implies constant economic growth of the agricultural sector, technological progress, efficient resource management and increase in the quality of life [21]. The agricultural production system, which is environmentally friendly but is not economically sustainable for the producer, cannot be regarded as acceptable.

The second factor, whose eigenvalue is 2.08, could be defined as the technological aspect in agricultural production, observedthrough the use of inputs (used fertilizers per hectare) and share of arable land in the total agricultural land. Both indicators referto the management of agricultural land, with the inevitable impact of agriculture on the environment.The used fertilizer per hectare is a significant indicator of sustainability of agricultural production (factor loading is 0.84). Notably, many authors define sustainability of agriculture as the function of the level of used inputs, such as fertilizers [24], [17]. Appropriate use of fertilizers increases the productivity of land, whereas, on the other hand, the environmental effect that the use of these inputsproduces on the quality of natural resources must be pointed out. N mineral fertilizers are produced using high amounts of energy (gas), and therefore contribute to greenhouse gasemission and fossil fuel depletion. Some environmental pollution issues caused by the production of P mineral fertilizers are related to the contamination of phosphate rocks with heavy metals and other elements which, once released into the environment or transferred onto the soil, may pose a risk to ecosystems and humans [5].

The third factor comprises the following indicators: share of irrigated areas in the total agricultural land and greenhouse gas emission from agriculture. This factor, with eigenvalue of 1.56, accounts for 11.17% of total variation. Emission of harmful gases from agriculture, causing the greenhouse effect, represents a direct, negative impact of agricultural production on the environment. For this reason, the European Union has defined measures and

Table 3: Factor scores

Factor 1		Factor 2		Factor 3		Factor 4	
Belgium	3.00488	Ireland	3.85322	Malta	2.62267	Austria	1.91518
The Netherlands	2.93382	Slovenia	1.33481	Cyprus	2.47432	Sweden	1.33544
Luxembourg	1.41040	The UK	1.05294	Italy	1.25029	The UK	1.14647
Denmark	1.21456	Portugal	0.68071	The Netherlands	0.99478	Slovenia	0.99610
Germany	0.59173	Croatia	0.66807	Luxembourg	0.81443	Italy	0.96516
France	0.52475	Malta	0.50753	Romania	0.73824	Germany	0.84911
The UK	0.04892	Luxembourg	0.34862	Greece	0.62982	Luxembourg	0.81277
The Czech Republic	0.03312	Spain	0.29295	Denmark	0.47454	Denmark	0.61119
Ireland	0.00510	Cyprus	0.18844	Spain	0.33493	The Czech Republic	0.55222
Slovenia	-0.03210	Greece	0.17436	Portugal	0.31071	France	0.54517
Malta	-0.19153	France	0.13941	Finland	0.16541	Spain	0.42536
Finland	-0.19699	Belgium	0.13400	Bulgaria	0.11026	Finland	0.33818
Austria	-0.25780	The Netherlands	0.10582	Slovenia	-0.10194	Estonia	0.28097
Sweden	-0.26066	Italy	0.08044	The UK	-0.14791	Portugal	0.13763
Spain	-0.28167	Romania	-0.02232	Slovakia	-0.19906	Slovakia	0.10088
Italy	-0.28413	Bulgaria	-0.18831	Croatia	-0.22722	Malta	0.07633
Lithuania	-0.34036	Germany	-0.22470	Hungary	-0.32370	Cyprus	-0.00669
Portugal	-0.34770	**Serbia**	-0.26294	France	-0.33682	Ireland	-0.01787
Hungary	-0.41302	Austria	-0.34718	Germany	-0.37335	Latvia	-0.15013
Croatia	-0.42468	Latvia	-0.35447	Poland	-0.37884	Lithuania	-0.48046
Slovakia	-0.49067	Lithuania	-0.47139	**Serbia**	-0.43907	Greece	-0.61176
Poland	-0.55854	Poland	-0.48423	Sweden	-0.57804	The Netherlands	-0.62656
Estonia	-0.71030	Hungary	-0.64962	Belgium	-0.74981	Hungary	-0.74648
Latvia	-0.71417	Estonia	-0.83226	Austria	-0.76381	Bulgaria	-0.76049
Greece	-0.74015	Slovakia	-0.86914	Lithuania	-1.10492	Belgium	-0.86178
Romania	-0.74308	The Czech Republic	-0.97280	The Czech Republic	-1.14530	Croatia	-0.92303
Bulgaria	-0.75587	Finland	-1.14287	Estonia	-1.23530	Poland	-1.49456
Serbia	-0.90076	Sweden	-1.23862	Latvia	-1.25019	Romania	-1.55505
Cyprus	-1.12310	Denmark	-1.50050	Ireland	-1.56509	**Serbia**	-2.85331

Source: The authors' own calculations

directives influencing the reduction of greenhouse gases inthe agricultural sector [5]. The second indicator shaping this factor is irrigation. Irrigation of agricultural areas influences productivity and sustainability, primarily insmall farms, reflecting its socio-economic significance [12]. Furthermore, the impact of irrigation on the environment should not be underestimated. Wriedit et al. [22] point out that developed countries use modern, sustainable irrigation systems, in accordance with environmental protection regulations. In addition to this, in certain European countries (in the Mediterranean region), irrigation is of key importance primarily because dry spells, without irrigation, cause lower yields, whilethe surplus of nitrogen remainsaccumulated in the soil after the harvest.This factor, however, is the most difficult to define, as irrigation may produceboth positive and negative effects on the environment.Therefore, a more comprehensive analysis of this indicator is necessary, while also taking into account the availability of water at the local level, source of water for irrigation and other indicators revealingthe environmental impact of using water in agriculture.Irrigated areas in Serbia are insufficient (1.77% of total agricultural land), accompanied by a lack of regulations in the segment of environmental protection and reduction of greenhouse gas emission from agriculture [2]. Given thatone of the prerequisites for Serbia's accession to the EU is harmonization of legislation in the domain of environmental protection, Serbia is faced with agreat task of aligningthese policies and regulations with the EU legislation.

The last factor, whose eigenvalue is 1.22, accounts for 8.70% of total variation. The focus here is on organic production (factor loading is 0.74) and its connection with the concept of sustainable agriculture. As far as sustainability of agriculture is concerned, it is in most cases observedthrough the technological side of sustainability of agriculture, which is represented by various agricultural practices protecting the environment [15]. One of such systems is organic production. Increase in demand for products that are in compliance with environmental principles of production (environmentally friendly) in the European Union has resulted in the development of this technology [10]. Undoubtedly, this production which does not use chemical inputs yieldsmultiple benefits for the society as a whole [14]. In other words, organic production couldcontribute to socio-economic and environmentally friendly sustainable development, with the possibility of increasing revenues and improving quality of life [1]. This is where its importance is actually reflected. Factor scores placeSerbia almost at the bottom of the ranking table, which suggeststhat relative lag in production performance also entails the inability toadequately develop organic production in Serbia. Nevertheless, this result wasto be expected given that, among the analyzed countries, Serbia has the smallest share of land under organic production in the total area (0.15%).

Conclusion

The results of this study point out the significance of certain dimensions of sustainability of agriculture.Namely, the factors obtained within this model identify economic, technological and environmental aspects of sustainability of agriculture.However, it must be emphasized that it is not possible to draw a clear-cut linebetween these dimensions. For instance, productivity of agriculture depends on the agroecological conditions within a country. Also, the second factor, i.e. the technological aspect, could also be observedas the environmental dimension of agriculture. In other words, sustainability of agriculture is, in most cases, perceived as overcoming the conflict between economy and ecology, where it implies production that enables achieving high yields and profit without degradation of the environment and natural resources on which agricultural production is based. Thus, this definition of agriculture implies benefits both for producers and society as a whole.

In this paper, the economic aspect within the model of sustainable agriculture represents the most significant factor, accounting for 42.46% of total variation. The performance of agriculture within the first factor shows the level of development of agriculture, where the unfavorable position for Serbia is perceived. Economies such as the Benelux countries, Denmark, Germany, France and Great Britain boastthe best production and export performance of agriculture. In addition, the use of inputs, land management and the impact of agriculture on the environment (the second and the third factor) are important aspects of sustainable development of agriculture. Organic production, as one of the model variables, was taken under the supposition that sustainable agriculture is reflected in the introduction of new technologies in production while adhering to environmental principles. It is difficultto determine which analyzed country or group of countries has put in placea sustainable system of agriculture, given thatsynchronized development of all dimensions of sustainability is virtuallyimpossible.This leads to a conclusion that it is necessary to determine the degree of significance ofeach selected indicator for each country at the given moment of its development. It is also important to emphasize that insufficient environmental awareness, as well as the lack of motivation on the part ofcurrent generations not to impairthe future generations with their activities, are yet additional obstacles to the sustainable development of agriculture within a country.

In practice, sustainability of agriculture is achieved by coordinating the activities of agricultural and environmental policies. Significance of sustainability within the European Union has already been brought to the forewith adoptedlaws and directives aimed at the preservation of the agro-environment. On the other hand, in comparisonto the European Union member states, Serbian agricultural performance is significantly lagging behind. The imperative of Serbia's agricultural policy in the future should be the alignment with the principles of the EU's Common Agricultural Policy, as well as the harmonization of environmental policies andthe EU rules. A chance for Serbian agriculture are the IPA (Instrument for Pre-Accession Assistance) and IPARD components of pre-accession assistance to candidate countries for EU accession whoseaim isto reduce development disparities. Therefore, it is necessary to emphasize that the effects of these funds (improving the quality of life, environmental protection) will depend on the efficiency of its disbursement, as well as on the modality of using therespective funds.

References

1. Birovljev, J., & Štavljanin, B. (2011). Development of organic food production in European countries with comparable resources. *Strategic Management*, *16(3),* 23-33.
2. Birovljev, J., Matkovski, B., & Ćetković, B. (2014). Poljoprivreda I zaštita životne sredine Srbije u funkciji prilagođavanja Zajedničkoj agrarnoj politici Evropske unije. *Anali Ekonomskog fakulteta u Subotici*, *50(32),* 17-29.
3. Osborne, J. W., & Costello, A. B. (2009). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Pan-Pacific Management Review*, *12(2),* 131-146.
4. Edwards, C. A. (1989). The importance of integration in sustainable agricultural systems. *Agriculture, ecosystems & environment*, *27(1-4),* 25-35.
5. European Commission. (2007). *Klimatske promene – izazoviza poljoprivredu*. Retrieved fromhttp://www.seerural.org/wp-content/uploads/2009/05/01_KLIMATSKE-PROMENE-Izazovi-za-poljoprivredu.pdf
6. European Commission. (2013). Overview of CAP Reform 2014-2020. Retrieved from http://ec.europa.eu/agriculture/policy-perspectives/policy-briefs/05_en.pdf
7. Gómez-Limón, J. A., & Sanchez-Fernandez, G. (2010). Empirical evaluation of agricultural sustainability using composite indicators. *Ecological economics*, *69(5*), 1062-1075.
8. Hamblin, A. (1991, November). How do we know when agricultural systems are sustainable? In *Environmental indicators for sustainable agriculture*. Report on a national workshop. LWRRDC and GRDC.
9. Keeney, D. R. (1989). Toward a sustainable agriculture: Need for clarification of concepts and terminology. *American Journal of Alternative Agriculture*, *4(3-4),* 101-105.
10. Lampkin, N. H., & Padel, S. (1994). *The economics of organic farming: An international perspective* (No. 338.162 E19e). Oxon, GB: CAB International.
11. Matkovski, B., & Kleut, Ž. (2014). Integration processes and rural development policy as factors affecting competitiveness and economic efficiency of agrarian economy of Serbia. In *Strategic Management and Decision Support Systemsin Strategic Management* - 19th International Scientific Conference SM2014, Subotica, Serbia.
12. Mihailović, B., Cvijanovic, D., Milojević, I., & Filipović, M. (2014). The role of irrigation in development of agriculture in Srem district. *Ekonomika poljoprivrede*, *61*(*4),* 989.
13. Organization for Economic Cooperation and Development/OECD (2001). *Environmental indicators for agriculture: Methods and results*. Retrieved from https://www.oecd.org/tad/sustainable-agriculture/40680869.pdf
14. Rigby, D., & Cáceres, D. (2001). Organic farming and the sustainability of agricultural systems. *Agricultural Systems*, *68(1),* 21-40.
15. Schaller, N. (1993). The concept of agricultural sustainability. *Agriculture, ecosystems & environment*, *46(1),* 89-97.
16. Siche, J. R., Agostinho, F., Ortega, E., & Romeiro, A. (2008). Sustainability of nations by indices: Comparative study between environmental sustainability index, ecological footprint and the energy performance indices. *Ecological Economics*, *66(4),* 628-637.
17. Stoate, C., Boatman, N. D., Borralho, R. J., Carvalho, C. R., De Snoo, G. R., & Eden, P. (2001). Ecological impacts of arable intensification in Europe. *Journal of Environmental Management*, *63(4),* 337-365.
18. Stockle, C. O., Papendick, R. I., Saxton, K. E., Campbell, G. S., & Van Evert, F. K. (1994). A framework for evaluating the sustainability of agricultural production systems. *American Journal of Alternative Agriculture*, *9(1-2),* 45-50.
19. Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston: Pearson Allyn & Bacon.
20. The United Nations Conference on Environment and Development, Earth Summit/UNCED. (1992). *Rio declaration on environment and development*. Rio de Janeiro, Brazil.
21. Vićentijević, D., Aćimović, L. J., & Stevanović, S. (2011). Uticaj tehnološkog razvoja na održivi razvoj poljoprivrede i zaštitu životne sredine. *Ekonomika poljoprivrede*, *58(2),* 191-203.
22. Wriedt, G., Van der Velde, M., Aloe, A., & Bouraoui, F. (2009). Estimating irrigation water requirements in Europe. *Journal of Hydrology*, *373*, 527-544.
23. Yunlong, C., & Smit, B. (1994). Sustainability in agriculture: a general review. *Agriculture, Ecosystems & Environment*, *49(3),* 299-307.
24. Zandstra, H. (1994). Sustainability and productivity growth: Issues, objectives and knowledge needs– Guidelines for working groups. In *Reconciling Sustainability with Productivity Growth*. Report of a workshop. Gainesville, Florida, May 1933, University of Florida and Cornell University.

Jelena Birovljev

is Full Professor at the Faculty of Economics in Subotica, University of Novi Sad. Her scientific research areas are management in agribusiness, agribusiness strategy and management of organic food production. She is President of the Association of Economists in Subotica and a member of the Presidency of the Association of Economists of Vojvodina, as well as of the Serbian Association of Economists. She was also Vice Dean for Finance and Administration at the Faculty of Economics in Subotica. She has published over 150 scientific papers and participated at numerous conferences in the country and abroad. She is author of several books covering issues in the field of organization, management and agribusiness. She has participated in national and international projects dealing with economic issues. She lives and works in Subotica.

Žana Kleut

is Teaching Assistant at the Faculty of Economics in Subotica, University of Novi Sad. In 2014, she received her master's degree from the Faculty of Economics in Subotica, University of Novi Sad. Currently, she is a doctoral student of agricultural economics. She published several papers in the field of agricultural and rural development. She also participated in several national and international conferences.